

Sustainable Webs of Interests:
Property in an Interconnected Environment

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I. INTRODUCTION

Property issues arise in interconnected physical, social, and legal environments. All indications point to interconnections that are complex, far-reaching in scope, multi-scalar, dynamic, and nonlinear.¹ Property institutions

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¹ James Salzman & J.B. Ruhl, *Climate Change, Dead Zones, and Massive Problems in the Administrative State: A Guide for Whittling Away*, 98 CAL. L. REV. 59 (2010); DISCONTINUITIES IN ECOSYSTEMS AND OTHER COMPLEX SYSTEMS (Craig R. Allen & C.S. Holling, eds., 2008); J.B. Ruhl, *Law's Complexity: A Primer*, 24 GA. ST. U. L. REV. 885 (2008) [hereinafter Ruhl, *Law's Complexity*]; PANARCHY: UNDERSTANDING TRANSFORMATIONS IN HUMAN AND NATURAL SYSTEMS (Lance H. Gunderson & C.S. Holling, eds. 2002); J.B. Ruhl, *The Fitness of Law: Using Complexity Theory to Describe the Evolution of Law and Society and Its Practical Meaning for Democracy*, 49 VAND. L. REV. 1407 (1996) [hereinafter Ruhl, *The Fitness of Law*]; J.B. Ruhl, *Complexity Theory as a Paradigm for the Dynamical Law-and-*

must adapt to these complexities and changing conditions. However, it has become apparent that the patterns and practices of our uses of land, water, and the environment are unsustainable ecologically and socially.

While both legal and sociocultural understandings of property are evolving, they remain hampered by the supposedly wealth- and production-maximizing concept that property is a 'bundle of rights,' based on the mental image of a 'bundle of sticks,' with each stick representing a different right or entitlement.² Defining property as a set of legal rights or entitlements protected by legal and political institutions for the purpose of facilitating wealth acquisition and production is far too limited to facilitate sustainable relationships between people and their environments and among people. The 'bundle-of-rights' concept treats both the resources that are the object of private property rights and the rights-holders as disconnected from the ecological and social environments in which both exist.

An alternative concept of property is that property is a 'web of interests,' in which interests are defined by the particular characteristics of the object of the property (including natural features and environmental carrying capacity) and by the interconnected relationships that people, entities, and institutions form with

Society System: A Wake-up Call for Legal Reductionism and the Modern Administrative State, 45 DUKE L.J. 849 (1996); Craig Anthony (Tony) Arnold, *The Structure of the Land Use Regulatory System in the United States*, 22 J. LAND USE & ENVTL. L. 441 (2007); TALCOTT PARSONS, *SOCIETIES: EVOLUTIONARY AND COMPARATIVE PERSPECTIVES* (1966); TALCOTT PARSONS, *THE SYSTEM OF MODERN SOCIETIES* (1971).

² GREGORY S. ALEXANDER, *COMMODITY & PROPRIETY: COMPETING VISIONS OF PROPERTY IN AMERICAN LEGAL THOUGHT, 1776-1970* 319-23, 381-82 (1997); CAROL M. ROSE, *PROPERTY AND PERSUASION: ESSAYS ON THE HISTORY, THEORY, AND RHETORIC OF OWNERSHIP* 278-81 (1994); J.E. Penner, *The "Bundle of Rights" Picture of Property*, 43 UCLA L. REV. 711 (1996); Jeanne L. Schroeder, *Chix Nix Bundle of Sticks: A Feminist Critique of the Disaggregation of Property*, 93 MICH. L. REV. 239 (1994); Kenneth J. Vandavelde, *The New Property of the Nineteenth Century: The Development of the Modern Concept of Property*, 29 BUFF. L. REV. 357 (1980).

respect to the particular object.³ This concept, previously developed in an article in the *Harvard Environmental Law Review*, reflects the kind of property relationships that exist in society – that is, the ways by which people form relationships with “things” (even if intangible) and with one another with respect to “things” – and the kind of relationships that exist between people and their physical and natural environments.⁴

This article discusses how the ‘web of interests’ concept might facilitate a more ecologically and socially sustainable definition of property interests amid the realities of the interconnected environments in which property issues arise. While the concept can be applied to intellectual property, property interests in business organizations and financial investments, and other forms of property,⁵ this chapter focuses on property in land and water.

II. THE EVOLUTION OF INTERCONNECTED ECOLOGICAL AND SOCIAL ENVIRONMENTS

Sociolegal systems evolve, not merely by changing gradually over time, but by exhibiting systemic emergence in response to and as a result of many complex, interconnected, and dynamic forces in society, legal institutions, and the environment.⁶ These changes result from a combination of purposeful design and unintended or uncoordinated forces. They include “deliberate institutional design that is motivated, shaped, or mediated by spontaneous or organic evolutionary forces; and the evolutionary variation and selection processes that arise out of the deliberate choices and behaviors of actors within the institutions.”⁷

³ Craig Anthony (Tony) Arnold, *The Reconstitution of Property: Property as a Web of Interests*, 26 HARV. ENVTL. L. REV. 281 (2002).

⁴ *Id.*

⁵ *Id.* at 358-63.

⁶ Ruhl, *The Fitness of Law*, *supra* note 1.

⁷ Craig Anthony (Tony) Arnold, *Fourth-Generation Environmental Law: Integrationist and Multimodal*, 35 WM. & MARY ENVTL. L. AND POL’Y REV. (forthcoming 2011).

Theoretical assertions that property institutions and the common law evolve over time toward more efficient or wealth-maximizing arrangements⁸ have little to no empirical support and ignore evolutionary biology theory that evolution does not necessarily produce optimization.⁹ Instead, borrowing certain ideas and metaphors from evolutionary biology and the ecology of complex adaptive systems, sociolegal evolutionary theory identifies a number of factors in the law's development:

1. *Complexity of systems*: Sociolegal systems are complex, dynamic, and adaptive.
2. *Chaos*: Change may appear random and chaotic due to the effects of sensitivity of conditions under deterministic rules.

⁸ Harold Demsetz, *Toward a Theory of Property*, 57 AM. ECON. REV. 347 (1967); RICHARD A. POSNER, *ECONOMIC ANALYSIS OF THE LAW* (1973); George L. Priest, *The Common Law Process and the Selection of Efficient Rules*, 6 J. LEGAL STUD. 65 (1977); Paul Rubin, *Why is the Common Law Efficient?*, 6 J. LEGAL STUD. 51 (1977).

⁹ Daniel M. Katz et al., *Social Architecture, Judicial Peer Effects and the 'Evolution' of the Law: Toward a Positive Theory of Judicial Social Structure*, 24 GA. ST. U. L. REV. 975 (2008); Mark J. Roe, *Chaos and Evolution in Law and Economics*, 109 HARV. L. REV. 641 (1996); Abraham Bell & Gideon Parchomovsky, *The Evolution of Private and Open Access Property*, 10 CMTY & PROP. 77 (2008); Christopher Kingston & Gonzalo Caballero, *Comparing Theories of Institutional Change*, 5 J INSTL. ECON. 151 (2009); Anthony Niblett et al., *The Evolution of a Legal Rule*, (NBER, Working Paper No. W13856), available at <http://ssrn.com/abstract=1106582> (last visited Aug. 13, 2010).

3. *Emergence*: Change results from “the appearance of unforeseen qualities from the self-organizing interaction of large numbers of objects, which cannot be understood by studying any one of the objects.”¹⁰
4. *Heterogenous dynamics*: Change results from the actions and interactions of numerous and diverse varieties of actors, groups, components, and subsystems within a system.
5. *Nonlinear dynamics*: Change often does not happen in continuous, sequential fashion, but instead is characterized by discontinuities in space and time due to relationships and effects that are geographically and temporally nonlinear.
6. *Fitness adaptation*: Systems and their components undergo behavioral and structural changes in response to environmental conditions, under deterministic rules, and subject to structural constraints in order to sustain or achieve the system’s fitness for its environment.
7. *Path dependence*: A system’s possible pathways of change at any given point in time and under any given set of circumstances are limited, or at least partially limited, by the system’s prior evolutionary paths.
8. *Stabilizing influences of niches, self-organized structure, and critical states*: Systems develop a certain amount of nonstatic stability by occupying niches (a place or role in its larger environment), by self-organization around deep structural rules governing system behavior as the system scale grows, and by incremental, surface, or edge changes under a “stable disequilibrium” that relieves pressures for radical and deep structural changes.

¹⁰ Ruhl, *The Fitness of Law*, *supra* note 1, at 1439.

9. *Resilience, resistance, and modularity:* Systems seek, develop, and survive through resilience to disturbances, threats, and changing conditions. Resilience comes not only from fitness adaptation (see 6 above), but also from adaptive resistance to perturbations and from modular organization and functioning, which involves the uses and combinations of pre-organized response methods and actions in flexible, decentralized, and adaptive ways.

10. *Disturbance, catastrophe, and tipping points:* Despite systemic stabilities and resilience, both small- and large-scale structural changes to the self-organized state can arise out of disturbances or perturbations, particularly those of either a massive or cumulative nature, that trigger “tipping points” of potentially irreversible and nonlinear change to a new state.

11. *Competition and cooperation:* Change results from the competition among systems or system components (including individuals, organizations, and groups) for scarce resources and the resulting pressures to reduce this competition (e.g., niche change, elimination of competitors). Change also results from cooperation among systems or system components (including individuals, organizations, and groups) to enhance mutual survival probabilities through shared or collective action and functions.

12. *Co-evolution:* Two systems or system components may evolve in interlinked ways, rather than through separate lines of evolution, often through a combination of cooperation, competition, and conflict and due to larger-scale complex relationships among systems. Complexities and unexpected outcomes arise when the two systems co-evolve under different temporal and spatial conditions.

13. Network connectivity and feedback: System change occurs through the “high connectivity, or feedback, between agents, parts, and scales of the system, creating a network of nodes and channels through which information (energy, money, food) flows.”¹¹ Diffusion of ideas, information, and innovation occur through networks, thus increasing the scope or pace of change.¹²

These dynamics are seen in the characteristics of actual property institutions in society. Property in society is multidimensional. The super-dominance of private markets, consumerism, perpetual growth objectives, and financial wealth maximization in our use of resources has harmed the other dimensions of our relationships with both things and nature – the ethical, spiritual, psychological, community-shaping, and even physical-health dimensions of resource use and management.¹³ As a result, the legal dimensions of property have become largely detached from the many characteristics and functions of property in society. Thus property owners experience alienation from nature, community, self, and God to the extent that they view property abstractly in terms of its investment value, commodity value, or economic productivity value.¹⁴

The multiple dimensions of property manifest themselves in the remarkable lack of purely private property in practice. Distinctions among private property, public property, common property, and nonproperty are merely for conceptual convenience and do not reflect the actual reality that most – perhaps even all – property regimes are mixed regimes. As Professor Dan Cole of Indiana University as written:

¹¹ Ruhl, *Law's Complexity*, *supra* note 1, at 898.

¹² This list is adapted from Arnold, *supra* note 7 (nonquote citations omitted).

¹³ Arnold, *supra* note 3, at 297-316.

¹⁴ *Id.*

There is no such thing as a pure or unadulterated public or private property system. As Charles Geisler has noted, all existing property regimes are more or less admixtures, comprising various individual, group, and public rights. A property regime can only be relatively public or private. Public/state property regimes are never unalloyed by private (individual or common) interests. Similarly, private property is never devoid of public or common rights.¹⁵

Consider, for example, rights to use water from a flowing river. The rights do not exist merely in some abstract legal or economic world, but instead exist in the context of an actual river with water quantities, water qualities, directional flow and velocity of water within a physical river bed-and-bank structure inhabited by rich biological life and shaped by an entire hydrologic process that is connected to larger ecological systems, biological and energy processes, and landscapes.¹⁶ In many jurisdictions, the state has ownership of the river and regulates its uses and quality, all of which are indicia of public ownership.¹⁷ However, individuals and

¹⁵ DANIEL H. COLE, *POLLUTION AND PROPERTY: COMPARING OWNERSHIP INSTITUTIONS FOR ENVIRONMENTAL PROTECTION* 13 (2002) (citations omitted).

¹⁶ BOB DOPPELT ET AL., *ENTERING THE WATERSHED: A NEW APPROACH TO SAVE AMERICA'S RIVER ECOSYSTEMS* (1993); DAVID M. GILLILAN & THOMAS C. BROWN, *INSTREAM FLOW PROTECTION: SEEKING A BALANCE IN WESTERN WATER USE* (1997); SANDRA POSTEL & BRIAN RICHTER, *RIVERS FOR LIFE: MANAGING WATER FOR PEOPLE AND NATURE* (2003); MARJORIE M. HOLLAND ET AL., *ACHIEVING SUSTAINABLE FRESHWATER SYSTEMS: A WEB OF CONNECTIONS* (2003); GARY J. BRIERLEY & KIRSTIE A. FRYIRS, *GEOMORPHOLOGY AND RIVER MANAGEMENT: APPLICATIONS OF THE RIVER STYLES FRAMEWORK* (2005); Christine A. Klein, *On Integrity: Some Considerations for Water Law*, 56 ALA. L. REV. 1009 (2005).

¹⁷ See, e.g., Mont. Const. art. IX, § 3; Utah Code § 73-1-1 (2010); Va. Code Ann. § 1-302 (2005); *Bamford v. Upper Republican Natural Resource District*, 512 N.W.2d 642 (Neb. 1994); *Baeth v. Hoisveen*, 157 N.W.2d 728 (N.D. 1968); *In re Water Use Permit Applications (Waiahole Ditch)*, 9 P.3d 409 (Haw. 2000); *Phillips Petroleum Co. v. Mississippi*, 484 U.S.

private entities, whether as riparian landowners or authorized appropriators of the water, have private rights to use certain quantities of water from the river for certain purposes, perhaps under certain circumstances, all of which suggest private ownership.¹⁸ Nonetheless, the public may have rights to make certain navigational, recreational, or similar uses of the water, in a form of common interest in water.¹⁹ Finally, in many jurisdictions, no one owns the atmospheric precipitation or diffused runoff that eventually replenishes the river until it enters the defined waterway: this is a type of nonownership.²⁰ While we can analyze

469 (1988); *National Audubon Society v. Superior Court*, 658 P.2d 709 (Cal. 1983); Fla. Stat. § 373.223 (2010); *Harloff v. City of Sarasota*, 575 So.2d 1324 (Fla. 1991); *Southwest Florida Water Management District v. Charlotte County*, 774 So.2d 903 (Fla. App. 2001); *Shokal v. Dunn*, 707 P.2d 441 (Idaho 1985); *In re Application for Change of Appropriation Water Rights*, 816 P.2d 1054 (Mont. 1991). See also Shelley Ross Saxer, *The Fluid Nature of Property Rights in Water*, 21 DUKE ENVTL. L. & POL'Y F. (forthcoming 2010).

¹⁸ See, e.g., *Port of Portland v. Reeder*, 280 P.2d 324 (Ore. 1955); *Douglaston Manor, Inc. v. Bahrakis*, 678 N.E.2d 201 (N.Y. 1997); *Tulare Lake Basin Water Storage District v. United States*, 49 Fed. Cl. 313 (2001); *Hydro Reserve Corporation v. Gray*, 173 P.3d 749 (N.M. 2007); *Hage v. United States*, 35 Fed. Cl. 147 (1996), 35 Fed. Cl. 737 (1996), 42 Fed. Cl. 249 (1998) (rescinded in part by 51 Fed. Cl. 570 (2002)); Saxer, *supra* note 17; Kathryn M. Casey, *Water in the West: Vested Water Rights Merit Protection Under the Takings Clause*, 6 CHAP. L. REV. 305 (2003).

¹⁹ See, e.g., *Arkansas v. McIlroy*, 595 S.W.2d 659 (Ark. 1980); *Conaster v. Johnson*, 194 P.3d 897 (Utah 2008); *National Audubon Society v. Superior Court*, 658 P.2d 709 (Cal. 1983); *In re Water Use Permit Applications (Waiahole Ditch)*, 9 P.3d 409 (Haw. 2000). See also Erin Ryan, *Public Trust and Distrust: The Theoretical Implications of the Public Trust Doctrine for Natural Resource Management*, 31 ENVTL. L. 477 (2001).

²⁰ See JOSEPH L. SAX ET AL., *THE LEGAL CONTROL OF WATER RESOURCES: CASES AND MATERIALS* 118-25 (4th ed. 2006). For a case for non-

each type of ownership separately, this analysis can disconnect our thinking from the complex and mixed sharing of types of property interests in a particular resource.²¹

Likewise, let us think of a privately owned home and parcel of land within a residential community – the prototypical example of private ownership. But it is not so simple, because in this particular residential community the homeowner is both protected by and restricted by government land-use regulations, such as restrictions on using the land for industrial or commercial uses. In addition, access to the home may depend on the use of public streets and sidewalks, owned and maintained by the government. In many residential communities, there are also common properties such as parks, swimming pools, green spaces, or clubhouses, the ownership and use of which is shared by all homeowners in the community. Moreover, both private and public interests in land are shaped by the particular characteristics of the place in which the land is located and the role of the land-use regulatory system in mediating between people and places. Of course, we could simply treat the residential property as private property subject to certain regulatory limits and certain entitlements to use public and common property incidental to the private property. However, attempts to resolve any serious property issues in this community will very likely involve the complex mixture of property regimes shaping this particular community.²²

ownership of waters and lands at the ecologically sensitive edges of waterways, see Robert W. Adler, *The Law at the Water's Edge: Limits to 'Ownership' of Aquatic Ecosystems*, in WET GROWTH: SHOULD WATER LAW CONTROL LAND USE? 201-69 (Craig Anthony (Tony) Arnold, ed., 2005).

²¹ For discussions of the mix of public, communal, and private interests in water, see, e.g., Sandra B. Zellmer & Jessica Harder, *Unbundling Property in Water*, 59 ALA. L. REV. 679 (2008); Saxer, *supra* note 17.

²² For discussions of the complex public and private characteristics of residential property, see, e.g., Robert C. Ellickson, *Suburban Growth Controls: An Economic and Legal Analysis*, 86 YALE L.J. 385 (1977); EVAN MCKENZIE, *PRIVATOPIA: HOMEOWNER ASSOCIATIONS AND THE RISE OF RESIDENTIAL PRIVATE*

Property issues arise in socioecological contexts of interconnectedness and complexity. Natural environments form complex, interdependent, dynamic, uncertain, multifaceted systems. Likewise, humans form complex, interdependent, dynamic, uncertain, multifaceted social systems. Moreover, ecosystems and social systems are interconnected in complex, interdependent, dynamic, uncertain, and multifaceted ways.

Ecological and social realities are pushing legal systems worldwide to analyze property interests in new ways. However, different theories compete for dominance and no single concept has emerged to reflect these realities.²³ With

GOVERNMENT (1994); Bradley C. Karkkainen, *Zoning: A Reply to the Critics*, 10 J. LAND USE & ENVTL L. 45 (1994); Jerry Frug, *The Geography of Community*, 48 STAN. L. REV. 1047 (1996); Craig Anthony (Tony) Arnold, *The Structure of the Land Use Regulatory System in the United States*, 22 J. LAND USE & ENVTL. L. 441 (2007); Stephanie Stern, *Residential Protectionism and the Legal Mythology of Home*, 107 MICH. L. REV. 1039 (2009). On the relationship between public infrastructure and private property rights, see Carol M. Rose, *Big Roads, Big Rights: Varieties of Public Infrastructure and their Impact on Environmental Resources*, 50 ARIZ. L. REV. 409 (2008).

²³ Compare, e.g., Gregory S. Alexander et al., *A Statement of Progressive Property*, 94 CORNELL L. REV. 743 (2009); Kristen A. Carpenter et al., *In Defense of Property*, 118 YALE L.J. 101 (2009); Eric R. Claeys, *Takings, Regulations, and Natural Property Rights*, 88 CORNELL L. REV. 1549 (2003); ERIC T. FREYFOGLE, *THE LAND WE SHARE: PRIVATE PROPERTY AND THE COMMON GOOD* (2003); TERRY L. ANDERSON & DONALD R. LEAL, *FREE MARKET ENVIRONMENTALISM* (2001); Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1 (2000); JOSEPH WILLIAM SINGER, *ENTITLEMENT: THE PARADOXES OF PROPERTY* (2000); MARGARET JANE RADIN, *REINTERPRETING PROPERTY* (1993); Joseph L. Sax, *Property Rights and the Economy of Nature: Understanding Lucas v. South Carolina Coastal Council*, 45 STAN. L. REV. 1433 (1993); ROBERT C. ELLICKSON, *ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES* (1991);

the influence of post-modernism in both academia and society,²⁴ it has arguably become intellectually indefensible and quaintly naïve to talk of ‘realities.’ After all, my reality is different than your reality, according to post-modernism. And yet, this deconstructionist outlook hardly seems intellectually adequate or humanly responsible in the face of water or food shortages, species’ extinction, changing coastlines, human exposure to toxic substances, sprawling development that alters landscapes, water pollution, air pollution, changes in climate, joblessness, poverty, homelessness, and many other empirically observable conditions. Ironically, it is naïve to ignore the social, political, economic, psychological, physical, and natural forces that are pushing both law and society toward a reconceptualization of property. We need to understand these forces if we are to develop a concept of property that promotes sustainable uses of land and water in ways that are consistent with interconnected ecological and social conditions.

III. BUNDLES OF RIGHTS AND WEBS OF INTERESTS

As noted earlier, the dominant metaphor of property is that of a ‘bundle of rights’ or a ‘bundle of sticks’ in which each stick represents a separate, abstract, disaggregable right, such as the right to exclude, the right to possess (or exercise dominion and control), the right to use, the right to invest and receive income, the right to alienate (or transfer or dispose of), the right to manage, the right to be

STEPHEN R. MUNZER, *A THEORY OF PROPERTY* (1990); Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711 (1986).

²⁴ See, e.g., STANLEY J. GRENZ, *A PRIMER ON POSTMODERNISM* (1996); MICHEL FOUCAULT, *POWER/KNOWLEDGE: SELECTED INTERVIEWS AND OTHER WRITINGS, 1972-1977* (1980); RICHARD RORTY, *PHILOSOPHY AND THE MIRROR OF NATURE* (1979); JACQUES DERRIDA, *OF GRAMMATOLOGY* (1976); MICHEL FOUCAULT, *THE ARCHAEOLOGY OF KNOWLEDGE AND THE DISCOURSE ON LANGUAGE* (1972). Classic works applying postmodern deconstructionism to law are ROBERTO MANGABEIRA UNGER, *WHAT SHOULD LEGAL ANALYSIS BECOME?* (1996); ROBERTO MANGABEIRA UNGER, *THE CRITICAL LEGAL STUDIES MOVEMENT* (1986); MARK KELMAN, *A GUIDE TO CRITICAL LEGAL STUDIES* (1987).

secure, and the right to maintain quiet enjoyment.²⁵ Courts frequently and persistently use the terms 'bundle of rights' or 'bundle of sticks' to refer to property, as do casebooks on property law and property-related subjects and scholarly analyses of property issues.²⁶ The terms are especially widely used in nations influenced by English legal concepts, but are discussed by jurists, legal experts, and property specialists throughout the world. For example, a 2002 working paper published by the New Zealand Treasury on the topic of institutions and decision making for sustainable development makes the following statement: "Greater insights can be gained by viewing property rights as comprising a bundle of rights."²⁷

Analyzing or describing property as a bundle of rights was intended to introduce adaptability into legal treatment of property interests, allowing for disaggregation of rights among multiple rights-holders, property rights in intangibles, and protection of investments and market exchanges of property-related value that could be disconnected from physical, tangible items.²⁸

However, the bundle-of-rights concept suffers from several problems. First, it conflates property with rights without regard to the object of those rights, favoring the theoretical fluidity and malleability of property definitions over the functions of property as a distinct category of legal analysis.²⁹

Second, it tends to focus attention on the inherently fuzzy boundaries of what counts as property, rather than defining the "core" of property.³⁰

²⁵ Arnold, *supra* note 3, at 285.

²⁶ *Id.* at 284 n. 18, 290 n. 44, and 306 n. 107.

²⁷ Basil Sharp, *Institutions and Decision Making for Sustainable Development*, 30 (New Zealand Treasury, Working Paper 02/20, 2002), available at <http://www.treasury.govt.nz/publications/research-policy/wp/2002/02-20/twp02-20.pdf> (last visited August 13, 2010)

²⁸ Arnold, *supra* note 3, at 284-91.

²⁹ *Id.* at 291-93.

³⁰ *Id.* at 294-95.

Third, the bundle-of-rights concept disconnects property as an abstraction from its context. It fails to give attention to the nature or characteristics of the ‘object’ of those rights – the ‘thing’ itself, such as the real physical land and water – which are important features of the context in which property rights arise. In particular, the bundle-of-rights concept gives no meaningful consideration to the ecological characteristics of particular lands or waters in which rights are claimed.³¹

Fourth, the bundle-of-rights concept, with its emphasis on abstract, commodifiable rights, promotes the alienation of people from the object of their rights and the environments in which those rights arise, including alienation from self, others, work, faith, and nature.³²

Fifth, the bundle metaphor is rights-based, giving little to no attention to duties, responsibilities, stewardship ethics, and the sharing of interests in society. The metaphor frames the holder of property interests merely as holders of legal rights and entitlements with perhaps some government-imposed limits on their rights, but not as citizens of ecological communities and social communities, who share interests and responsibilities in the objects of their property rights.³³

Sixth, the bundle-of-rights concept does not accurately reflect many different types of property relationships in society, in which people form nonlegal, nonmarket, concrete connections to the things of our lives, emerging out of passions and emotions, the social, cultural, biological, religious, and psychological dimensions of group and family relationships, biophilic connections between people and natural environments, the politics of geography, human concepts and definition of place and space, and the like. In other words, real-world property practices do not fit neatly into each stick associated with a separate abstract legal right.³⁴

³¹ *Id.* at 295-97.

³² *Id.* at 297-303.

³³ *Id.* at 303-06.

³⁴ *Id.* at 306-16.

Finally, the bundle-of-rights concept standardizes the treatment of property rights and does not acknowledge inherent variations based on the ecological characteristics of the environments in which property interests are claimed. It is, therefore, ill-equipped to address the complex, multifaceted, and sometimes highly unpredictable impacts of nature and its processes on humans and society.³⁵

An alternative metaphor for property is that of a 'web of interests.'³⁶ According to this metaphor, property is a set of interconnections among persons, groups, and entities each with some stake in an identifiable (whether tangible or intangible) object at the center of the web.³⁷ All of the interest holders are connected both to the object and to one another.³⁸ Thus, any particular property interest in any particular object is defined by three features: (1) the characteristics of the object of that interest; (2) the characteristics of the relationship between the interest-holder and the object; and (3) the characteristics of the relationships between the interest-holder and all other holders of interests in the object.³⁹

The web of interests is a superior metaphor for property for several reasons. First, it gives attention to the particular object of property interests, including its natural or ecological characteristics and the broader context in which it exists. This context includes ecological functions, processes, and systems (e.g., landscapes, watersheds, species' habitat patches, energy flows, and nutrient cycles). It also includes human communities (e.g., neighborhood, metropolitan area, region), places of special meaning, and local culture. It includes the variable geographic scales in which what happens on Blackacre affects property, people, and environments in distant locations (i.e., the multi-scalar nature of property). It further includes the variable temporal scales in which what happens on Blackacre today affects property, people, and environments in the future, but is also

³⁵ *Id.* at 306-21.

³⁶ *Id.* at 331-42.

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

dependent on what has happened in the past and what is currently happening now. The web-of-interests metaphor adds contextualism, concreteness, interconnectedness, and social ecology to what is far too often a legally centralist, isolated abstraction about property.⁴⁰

The web of interests defines property as interests, not just rights. Thus it encompasses duties, responsibilities, and relationships. It does not try to chop up rights into different discrete units, but rather defines one's property interests by a holistic assessment of the person's relationships with the object of those interests and with the other holders of interests in the object. As a result, shared interests can be better conceptualized and accommodated, with an express recognition that property – in reality – has both public and private characteristics, both individual and common characteristics, both physical and nonphysical characteristics, both economic and noneconomic characteristics, both human and natural characteristics, and both legal and nonlegal characteristics.⁴¹

The web-of-interests metaphor has the capacity to adapt to society's changing needs and conditions, and nature's changing conditions.⁴² It understands that the objects of property interests and the relationships among interest holders, including the role of property law in mediating among those interests, have political, sociocultural, psychological, economic, ecological, and ethical characteristics that are constantly adjusting and evolving. As has been noted in this metaphor's development, "an understanding of property as a web of interests embraces the complexity, ambiguity, and constantly evolving nature of property law."⁴³

IV. SUSTAINABILITY PROBLEMS AT THE INTERSECTION OF LAND AND WATER

⁴⁰ *Id.* at 331-64.

⁴¹ *Id.*

⁴² *Id.* at 342, 345-49, 364.

⁴³ *Id.* at 342.

While the ‘web of interests’ may have theoretical or conceptual advantages to the ‘bundle of rights,’ a primary advantage is that the metaphor is an adaptive response to the need for a concept of property that facilitates and encourages environmental sustainability. In contrast, the current bundles-of- rights concept facilitates unsustainable land and water uses, and forms obstacles to more sustainable management and conservation of land and water.

Before exploring these practices, we should consider what we mean by the terms ‘sustainable’ and ‘unsustainable.’ There are many definitions of the concept of sustainability.⁴⁴ Indeed, criticisms that the term means everything and nothing – that it is general enough to encompass countless goals and choices and to have very little utility to guide property and environmental laws and policies – have some justification.⁴⁵ In addition, the concept may bear an inherent but unachievable optimism that robust economic development, widespread social equity, and flourishing environmental conditions can be achieved simultaneously without any hard choices or value-challenging trade-offs.⁴⁶

Moreover, the most common definitions of sustainability focus on responsibilities to future generations – the concern that current uses of resources compromise the ability of future generations to meet their needs⁴⁷ – but fail to give adequate attention to current harms and current environmental responsibilities. In other words, our practices may be unsustainable in their effects on people who are alive today and on the health, functioning, and vitality of other forms of life and the ecological systems of which humans are just a part. It is not just that we are using resources at a rate and in a manner that depletes or degrades them for future generations of humans. It is, more fundamentally, that we are using resources in a way that threatens or weakens the healthy functioning of

⁴⁴ John C. Dernbach, *Sustainable Development and the United States*, in *AGENDA FOR A SUSTAINABLE AMERICA* 5 (John C. Dernbach, ed., 2009).

⁴⁵ ERIC T. FREYFOGLE, *WHY CONSERVATION IS FAILING AND HOW IT CAN REGAIN GROUND* 113-43, 272 n. 2 (2006).

⁴⁶ *Id.*

⁴⁷ WORLD COMM’N ON ENV’T AND DEV., *OUR COMMON FUTURE* 43 (1987).

interconnected social and ecological systems. All of us are affected by uses of land and water – you, me, our neighbors, other communities, people halfway across the globe, social, political, and economic institutions, future generations, wildlife, plants, landscapes, soils, watershed structures and flows, energy cycles, climate conditions, food pyramids, and so on.

Nonetheless, disagreements about the precise meaning of sustainability or its application to specific circumstances should not deter us from observing that by almost any definition – other than perhaps the concept that each human owes responsibilities only to himself or herself to consume as much as he or she desires without regard to the effects on anyone or anything else, which is unsustainable and therefore not a true definition of sustainability – our current practices are unsustainable and require us to identify a property concept that can guide us toward more sustainable land and water uses.

Challenges to sustainability often occur where water and land meet. In particular, coastal lands,⁴⁸ which are transition zones between terrestrial and

⁴⁸ For various sources on the sustainability and property issues involved in coastal lands and their ecological and social dynamics, see, e.g., JOHN RANDOLPH, ENVIRONMENTAL LAND USE PLANNING AND MANAGEMENT 215-24, 549-54 (2004); TIMOTHY BEATLEY ET AL., AN INTRODUCTION TO COASTAL ZONE MANAGEMENT (2nd ed. 2002); F. JOHN VERNBERG & WINONA B. VERNBERG, THE COASTAL ZONE: PAST, PRESENT, AND FUTURE (2001); ERIC BIRD, COASTAL GEOMORPHOLOGY: AN INTRODUCTION (2000); KARL F. NORDSTROM, BEACHES AND DUNES OF DEVELOPED COASTS (2000); R.W.G. CARTER, COASTAL ENVIRONMENTS: AN INTRODUCTION TO THE PHYSICAL, ECOLOGICAL, AND CULTURAL SYSTEMS OF COASTLINES (1988); Donna R. Christie, *Of Beaches, Boundaries and SOBs*, 25 J. LAND USE & ENVTL. L. 19 (forthcoming 2010); Joseph L. Sax, *Some Unorthodox Thoughts about Rising Sea Levels, Beach Erosion, and Property Rights*, 11 VT. J. ENVTL. L. 641 (2010); Madeline Reed, *Seawalls and the Public Trust: Navigating the Tension Between Private Property and Public Beach Use in the Face of Shoreline Erosion*, 20 FORDHAM ENVTL. L. REV. 305 (2009); Meg Caldwell & Craig Holt Segall, *No Day at the Beach: Sea Level Rise, Ecosystem Loss, and Public Access Along the California Coast*, 34 ECOLOGY L.Q. 533 (2007); Amy H. Moorman, *Let's Roll:*

marine environments, are especially inhospitable to stable and secure private rights to exercise exclusive dominion and control. Coastal lands are constantly changing, shaped and altered by waves, winds, storms, and hurricanes. Beaches, shorelines, and barrier islands naturally migrate inland. These highly dynamic coastal zones are composed of interconnected environments, including beaches, dunes, upland barrier flats (which might be characterized by grasslands or forests), bluffs, barrier islands, sandbars, coral reefs, mangrove forests, kelp forests, seagrass and algae beds, submerged foreshore zones, tidal wetlands (e.g., saltwater marshes), and estuaries, where saltwater and freshwater mix (e.g., bays and back bays, lagoons, harbors, inlets, and sounds). Even though property law shifts property boundaries with the gradual changes of erosion and accretion but retains existing property boundaries with the sudden changes of avulsion, the reality is that the processes of beach erosion, sea level rise, hurricanes, storm surge, and sand drift along the shore are interconnected and difficult to sort out precisely.

The development of coastal lands – facilitated by a culture of strong private property rights, growth policies, and the societal framing of coasts as objects for human enjoyment and exploitation – has exacerbated their vulnerabilities and degraded these complex environments. More than half the population of the United States lives within 50 miles of the shoreline, even though this zone is only 17 percent of the nation’s land area. In addition, coastal areas attract high levels of tourism and ecosystem-altering beach usage, generating billions of dollars in revenue every year. Intense land development has altered or destroyed sea dunes, stabilizing vegetation (e.g., sea oats), wetlands, wildlife habitats, and other critical features. Stormwater runoff and pollution from both coastal and inland development, with its substantial use of runoff-increasing impervious cover and its alteration or destruction of runoff-absorbing “green infrastructure,” further degrade

Applying Land-Based Notions of Property to Migrating Barrier Islands, 31 WM. & MARY ENVTL. L. & POL’Y REV. 459 (2007); James G. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 MD. L. REV. 1279 (1998).

coastal areas. Sand flows along the shoreline are interrupted by human-created inlets and barriers, such as breakwaters and groins, thus accelerating erosion downshore. One common response to coastal erosion, sea-level rise, and marine storms has been armoring the shoreline by building sea walls or rock revetments. This type of shoreline alteration may temporarily protect existing structures but destroys beaches by cutting off the natural flow of sands. Another response has been beach restoration and renourishment, in which government agencies dredge sand from the ocean floor, pump or suck it through pipes, deposit it on the shore to replace lost sands, and sculpt the beach with bulldozers or graders to achieve the planned contours. However, these efforts are short-term fixes, lasting only three to five years in many cases, and alter critical natural features of the entire interconnected coastal system.

Yet another response has been government subsidization of coastal land development and even redevelopment after hurricanes and tropical storms, floods, severe coastal erosion, subsidence, and other events that are simply part of the transitional coastal zone processes, made all the more likely by human alterations of the environment. These subsidies include flood insurance, disaster relief, and regulatory controls that allow development and redevelopment in sensitive areas.

The unsustainability of these land-use patterns, facilitated by private property rights, is apparent from the many impacts of coastal development. Just a few such impacts include the loss of coastal-wetland and barrier-island capacity to absorb storm impacts, the losses of property and human life in high-risk areas, and the harms to sea turtle populations that have had their nesting beaches disturbed, altered, and even destroyed. Nonetheless, private property owners have responded to government efforts to regulate, manage, and limit coastal land development with litigation to enforce their “rights” and ensure their continued wealth-development and coastal exploitation, regardless of the futility of disconnecting abstract legal rights from the realities of interconnected social and ecological environments that cannot sustain unconstrained uses of coastal

lands.⁴⁹ Litigation outcomes and the growing scope and variety of government regulation suggest that the legal system is starting to recognize that the characteristics of coastal environments make a difference in defining property interests in those lands and that many complexly interconnected interests are held in coastal environments.⁵⁰ Both are insights that would be illuminated by the web-of-interests concept of property.

V. WATER RIGHTS

A. THE UNIQUE CHARACTERISTICS OF WATER

Perhaps the strongest case for thinking about property as a web of interests is water. Water itself deserves special attention, because it is different from land and other objects of property in a number of critical ways. Property law

⁴⁹ *Graham v. Estuary Properties, Inc.*, 399 So. 2d 1374 (Fla. 1981); *Matcha v. Mattox*, 711 S.W.2d 95 (Tex. App. 1986), cert. denied 581 U.S. 1024 (1987); *Phillips Petroleum Co. v. Mississippi*, 484 U.S. 469, 482 (1988) ; *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992); *Loveladies Harbor, Inc. v. United States*, 28 F.3d 1171 (Fed. Cir. 1994); *City of Monterey v. Del Monte Dunes at Monterey, Ltd.*, 526 U.S. 687 (1999); *Palazzolo v. Rhode Island*, 533 U.S. 606 (2001); *Palm Beach Isles Association v. United States*, 58 Fed. Cl. 657, 686 (2003); *McQueen v. South Carolina Coastal Council*, 580 S.E.2d 116 (S.C. 2003); *Palazzolo v. State of Rhode Island*, No. WM 88-0297 (R.I. Super. Ct. July 5, 2005); *Gove v. Zoning Board of Appeals of Chatham*, 831 N.E.2d 865 (Mass. 2005); *Stop the Beach Renourishment, Inc. v. Florida Department of Environmental Protection*, 130 S. Ct. 2592 (2010).

⁵⁰ In the landmark regulatory takings case of *Lucas v. South Carolina Coastal Council*, both Justice Kennedy in his concurrence and Justice Stevens in his dissent affirmatively asserted that the scope and nature of private property rights should evolve based on changing understandings and social values about sensitive coastal lands. 505 U.S. at 1035 and 1069-1070.

abstractions about exclusion, possession, use, management, and alienation rights do not fit neatly with the distinctive characteristics of water. There are 10 unique characteristics of water⁵¹ that require attention when determining the nature and scope of property interests in water:

1. *Bio-indispensability*. Water is required to sustain all life. Biological life cannot survive without water.
2. *Quantity*. Water has quantifiable volume and is measured in acre-feet and gallons (or millions or billions of gallons per day), or metric equivalents.
3. *Flow*. Water is heavy and greatly influenced by gravitation. It has: (a) direction (i.e., the direction of the flow); and (b) rate (amount of water per unit of time flowing past a given point), which is typically measured in cubic feet/meters per second.
4. *Temporal variability*. The quantity and location of water varies over time, depending on differences in climate, precipitation, flow, state (e.g., rain, snow, ice, evaporated water, clouds), composition, and the like.
5. *Geography*. Water varies by location influenced by climate, physical topography, hydrologic patterns, landscape and ecosystem features, and

⁵¹ For various sources on the unique characteristics of water, see, e.g., SAX ET AL., *supra* note 20, at 2-26; Zellmer & Harder, *supra* note 21; Klein, *supra* note 16; Saxer, *supra* note 17; Craig Anthony (Tony) Arnold, *Water Privatization Trends in the United States: Human Rights, National Security, and Public Stewardship*, 33 WM. & MARY ENVTL. L. & POL'Y REV. 785 (2009); James Salzman, *Thirst: A Short History of Drinking Water*, 18 YALE J.L. & HUMAN. 94 (2006); Ken Conca, *Environmental Governance After Johannesburg: From Stalled Legalization to Environmental Human Rights?*, 1 J. INT'L L. & INT'L REL. 132 (2005); Gabriel Eckstein, *Precious, Worthless, or Immeasurable: The Value and Ethic of Water*, 38 TEX. TECH L. REV. 963 (2006).

human place-based considerations (e.g., location of development, demands on and uses of water, types of communities formed around water, local culture, etc.). Place matters. Moreover, water exists in watersheds: areas of land that drain to a common point. Watersheds have nested scales, with smaller units existing within larger units. Catchments are nested within subwatersheds, which are nested within watersheds, which are nested within subbasins, which are nested within basins.

6. *Composition.* Water can be described and analyzed by its state (liquid, solid, gas, etc.) and by its quality, including levels of pollutants, sediment, temperature, turbidity, and the like.
7. *Integrated ecosystem functionality.* Water is part of larger ecological systems, with their functions, processes, component parts, interconnectivity, and dynamism (change over time). Thus, water is a component of forests or prairie savannahs, for example. However, water – particularly surface water – forms geographic- and hydrologic-based ecological systems or units known as watersheds, which are areas of land that drain to a common point (see item 5, above).
8. *Connectivity.* All water is interconnected as part of the hydrologic cycles. Interconnectivity exists along beds, channels, and conduits of surface waters, within watershed drainage, storage, and flow patterns, and between groundwater and surface water (despite the historic legal treatment of the two as separate due to fundamental scientific misunderstandings as the law developed).
9. *Value.* Water has economic value, often quite substantial value given the extent to which water is essential to all life, all societies, and all economies. Water has value as a commodity in markets. Water has human value that is not necessarily monetized (i.e., quantified in dollar amounts) or marketized (i.e., subject to trade and transactions). Water has ecological value,

including service to ecological systems and arguably inherent value to nature.

10. *Human meaning.* Water, including water in places that have special meaning, has a variety of meanings to humans. The types of meanings include spiritual or religious (all or nearly all religions ascribe some meaning to water), moral or ethical (including a diverse array of ethical principles that could define human relationships with water), social or communal (including formations of communities around water), and psychological and developmental (including the ways that our experiences with water shape our psychological well-being and our values).

B. UNSUSTAINABLE WATER USES

Water use practices in contemporary society threaten the integrity and sustainability of waters, water systems, and watersheds. Privatization, commodification, and unchecked consumption of water cause large-scale and long-term harms not only to water supplies but also to the social and ecological systems that depend on them.

Several examples illustrate these impacts. Consider the Chilean town of Quillagua, which has been called the driest place on earth, although this was not always so. The Loa River, which once supplied Quillagua and its region with water, is now highly polluted and nearly dry. In Chile's highly privatized regime of water rights, which are freely tradeable on the market, a single electric company purchased roughly 80 percent of the water rights in one large region, mining companies and agricultural producers have competed to allocate water rights to all the stream flows in the upstream portions of rivers, and mining companies have polluted much of the remaining water.⁵²

Persistent conflicts among the U.S. states of Georgia, Alabama, and Florida over the Apalachicola-Chattahoochee-Flint River System (ACF) have

⁵² Alexei Barrionuevo, *Chilean Town Withers in Free Market for Water*, N. Y. TIMES, March 15, 2009.

foundations in ongoing unsustainable uses of water. Georgia seeks substantially more water from the ACF – and its major reservoir, Lake Lanier – than its allotted share due to relentlessly growing demand, even though decreased downstream flows to Alabama and Florida would harm Alabama’s power industry, Florida’s fisheries in Apalachicola Bay, endangered mussels, and the overall river basin ecology. The relentlessly growing demand has been driven not only by population growth in the Atlanta area but also by the lack of water conservation planning and methods in the Atlanta metropolitan region, the lack of drought planning and preparedness, a 1,320 percent increase in agricultural withdrawals from the ACF from 1970 to 1990, and the region’s sense of entitlement to as much water as it wants. Remarkably, despite a severe drought that put Georgia in a water crisis and Atlanta arguably within 90 days of running out of water, resistance to sustainable water practices remains strong: the state’s first comprehensive water management plan, adopted in 2008, relies primarily on soft study and planning techniques instead of hard allocations; the Georgia Chamber of Commerce has insisted that water rights are private property and should be freely transferable without interference from state regulation; Atlanta adopted only modest conservation methods; and well drilling continued at such a pace, even during the drought, that well drillers could not keep up with the number of permitted new wells.⁵³

⁵³ For details on the ACF basin conflict and Georgia’s water practices, see, e.g., ROBERT GLENNON, *UNQUENCHABLE: AMERICA’S WATER CRISIS AND WHAT TO DO ABOUT IT* 23-49 (2009); Kristen Choo, *Gulp: Litigation Won’t End the Battles Over Depleted Water Resources in Several Regions of the United States*, A.B.A.J. 56 (2008); Janet C. Neuman, *Have We Got a Deal for You: Can the East Borrow from the Western Water Marketing Experience?*, 21 GA. ST. U. L. REV. 449, 449-51, 479-85 (2004); J.B. Ruhl, *Equitable Apportionment of Ecosystem Services: New Water Law for New Water Age*, 19 J. LAND USE & ENVTL L. 47 (2003); Joseph W. Dellapenna, *Interstate Struggles over Rivers: The Southeastern States and the Struggle over the “Hooch,”* 12 N.Y.U. ENVTL. L.J. 828 (2005); Press Release, Governor Sonny Perdue, Georgia, Governor Perdue Signs Water Plan into Law (Feb. 6, 2008), available at http://gov.georgia.gov/00/press/detail/0,2668,78006749_78013037_10

Two studies by Robert Glennon explore a variety of unsustainable water practices in the United States. In *Water Follies*, Glennon discusses the adverse impacts of groundwater overpumping, including the drying up of the Santa Cruz River in Tucson, Arizona; subsidence problems and the decline of springs, wetlands, and lakes due to Tampa, Florida's water "avarice;" harm to endangered species that rely on the over-consumed Edwards Aquifer in the San Antonio, Texas, region; and the total degradation of Massachusetts' Ipswich River Basin due to suburban development.⁵⁴ In *Unquenchable*, Glennon explores the conflicts and crises that characterize water use in the United States, ranging from Rockland County, New York to the Catawba River Basin in North Carolina and South Carolina, to the South Platte River Basin in eastern Colorado, to California's

[5162841,00.html](http://www.georgiawcip.org/PDF/WCIPDRAFT-December2008.pdf); GEORGIA DEPARTMENT OF NATURAL RESOURCES, ENVIRONMENTAL PROTECTION DIVISION, THE WATER CONSERVATION IMPLEMENTATION PLAN (2008), available at <http://www.georgiawcip.org/PDF/WCIPDRAFT-December2008.pdf>; GREGORY W. BOUNT ET AL., THE ROLE OF WATER RIGHTS AND GEORGIA LAW IN COMPREHENSIVE WATER PLANNING FOR GEORGIA: A WHITE PAPER TO THE JOINT COMPREHENSIVE WATER PLAN STUDY COMMITTEE BY THE GEORGIA CHAMBER OF COMMERCE (2002), <http://www.troutmansanders.com/mc/art-pickett2.pdf>; Debbie Gilbert, *Green Group Says Georgia Water Plan is No Plan at All*, GAINESVILLE TIMES, Feb. 2, 2008, available at <http://www.gainesvilletimes.com/news/archive/2851>; Lyle V. Harris, *Water Plan is Diluted and Deluded*, ATL. J.-CONST., Jan. 8, 2008, at A12, available at <http://www.cviog.uga.edu/spotlight/news/item.php?print=y&id=529>; Stacy Shelton, *Metro Water Plan: What Level of Commitment?*, ATL. J.-CONST., Jan. 18, 2009, available at <http://www.ajc.com/services/content/printedition/2009/01/18/waterplan01183dot.html>; PACIFIC INSTITUTE FOR STUDIES IN DEVELOPMENT, ENVIRONMENT, AND SECURITY, A REVIEW OF WATER CONSERVATION PLANNING FOR THE ATLANTA, GEORGIA REGION (2006), http://www.pacinst.org/reports/atlanta/atlanta_analysis.pdf; Kristen Johnson, *Georgia Governor Calls for State of Emergency Due to Drought* (WDEF News 12 television broadcast Oct. 20, 2007), available at http://wdef.com/news/georgia_governor_calls_for_state_of_emergency_due_to_drought/10/2007.

⁵⁴ ROBERT GLENNON, *WATER FOLLIES: GROUNDWATER PUMPING AND THE FATE OF AMERICA'S FRESH WATERS* 35-50, 71-86, 87-97, 99-111 (2002).

complex Bay-Delta system.⁵⁵ Another notable U.S. example of serious ecosystem degradation to meet “consumer” demand for water is the Colorado River, which has been studied extensively by Robert Adler.⁵⁶

These few examples represent common water-use practices in contemporary society that are characterized by three concepts about water: (1) water is to be privately owned, controlled, allocated, and used as an object of private property rights that trump any state or public interests in water; (2) water is a commodity to be developed, marketed, and transferred for profit by those able to exploit it and consumed by those able to pay for it, instead of being an integral and essential part of watersheds, place-based communities, the *polis*, and interconnected networks of biological life; and (3) water exists for limitless consumption for short-term human desires and relentless development, rather than as a multifunction and multivalue resource that requires long-term conservation and stewardship.⁵⁷

The convergence of these three concepts in practice creates unsustainability across several dimensions: ecological, temporal, geographical, social and ethical, and even economic.⁵⁸ Our privatized, commodified, and consumerized water-use practices are *ecologically unsustainable* because the disaggregation of water into discrete legal rights to control, sell, and use facilitates and encourages the extraction of water from rivers, creeks, streams, lakes, springs, groundwater aquifers, and other sources without regard to the instream ‘flows’ or water levels needed to sustain the ecosystems, biological life, water quality levels, and hydrologic structures and processes that depend on them. Legal systems governing water rights either do not recognize private rights in

⁵⁵ GLENNON, *supra* note 53, at 77-102.

⁵⁶ ROBERT W. ADLER, *RESTORING COLORADO RIVER ECOSYSTEMS: A TROUBLED SENSE OF IMMENSITY* (2007).

⁵⁷ Arnold, *supra* note 51, at 790-813.

⁵⁸ For a thorough discussion of these dimensions of unsustainability, see Arnold, *supra* note 51, at 828-32. See also GLENNON, *supra* note 54; GLENNON, *supra* note 53; POSTEL & RICHTER, *supra* note 16; HOLLAND ET AL., *supra* note 16; GILLILAN & BROWN, *supra* note 16; Klein, *supra* note 16.

maintaining instream flows, surface levels, and aquifer levels, or do a poor job of protecting any such rights against private rights to divert or pump the water and use it outside the source. As government regulations, government rights, and general public rights in maintaining water in situ for ecological conservation and/or human uses in situ (e.g., navigation, recreation) have been asserted, they have encountered obstacles in legal protections for private rights holders or in political and social pressures to prefer water uses that promote development, economic growth, and demands far from the source. The environmental consequences are many. For example, alterations of interconnected groundwater-surface water hydrology (e.g., saltwater intrusion, dropping aquifer levels, dried-up springs) and landscapes (e.g., subsidence, loss of native vegetation) result from the long-term pumping of groundwater sources at rates that exceed their recharge in order to provide abundant water for cities, homes, farms, businesses, and global water-bottling operations.

Current water-use practices are *temporally unsustainable* because they fail to ensure the long-term viability of waters and water systems and to constrain use to the renewable quantities and supplies of water. For example, one's private rights to use water may be limited by other's private rights to use water, but these limitations consider only current or near-term demands for water, not the interests of future water users or the long-term capacity of the water source itself. While theoretically one has an incentive to manage a privately owned resource for its long-term productivity and sustainability, in reality the culture of private property management and market behavior in the United States (and increasingly worldwide) emphasizes short-term profits, quick returns, and immediate consumption over long-term investments, patient stewardship, and preservation of financial, human, and natural capital. The economic health of business activity is measured by quarterly profits. The political viability of government leaders is measured by current economic conditions and their impacts on the capacity to satisfy consumer wants. People have great optimism that other sources of water can be found, acquired, or developed in the future, so we see no need to limit our current consumption even if it appears that we are draining our long-term supplies.

The norm of immediate gratification dominates our culture. As a result, private rights to use water serve immediate consumption demands without regard for the long-term sustainability of the resource. Moreover, public policies respond to the demands of the consumer public and economic interest groups by putting government authority and resources to the service of facilitating current consumption without engaging in long-term planning, infrastructure investments, conservation policies, and efforts to sustain the long-term capacity of waters and watersheds to meet a variety of human and ecological needs.

Our water-use practices are *geographically unsustainable* because water is disconnected from its physical, hydrological, and social place of origin when it is seen as the object of abstract private property rights or as a fungible, marketable, and transferable commodity. The private ownership, control, transfer, and use of water typically occurs at spatial scales that have very relationship to the nested watershed scales at which water hydrology functions. In some cases, global markets for water drive water consumption patterns. Moreover, as water is transferred from watersheds of origin, the communities that are defined by their relationships with these waters and watersheds – from fishing communities to river cities to spring-reliant rural communities to tourism-supporting lake regions – can decline.

Current water use practices are *unsustainable socially and ethically* because the private control of water poses risks to communities such as overconsumption, failures of water management and distribution systems, inadequate planning for the future, and harms to the economic and community-defining functions of area waters. Framing water as a consumer good disconnects it from its role in society, community, and religion and from the moral and ethical choices that must be made about its stewardship or management, allocation, use, and conservation. Private property regimes and markets fail to engage the public in deliberative, participatory, and ethical decision making about water resources.

The water rights regimes in the United States have been *unsustainable as a policy matter*, because they have been largely disconnected from related fields

of public policy, such as water quality regulation and protection, land use planning and regulation, disaster preparation and response, energy policy, biodiversity protection, and climate change mitigation and adaptation.

Finally, water use practices can be *unsustainable economically*. A focus on meeting consumer demand at cheap prices has resulted in the waste of water and underpricing for long-term conservation purposes. Market-based price mechanisms and incentives, which are desirable, have been confused with calls for unregulated private-market transfers, which can be problematic. Moreover, an overemphasis on the security and stability of private rights in water impede wealth-creating innovations and often produce costly intransigence in resolving water disputes.

C. STATE OWNERSHIP, PRIVATE INTERESTS, AND PUBLIC STEWARDSHIP

Sustainable management of water resources requires concepts of public and private stewardship of water with three foundations: (1) recognition of water as a public resource having shared public and private interests; (2) consideration of the unique characteristics of water in defining and resolving conflicts among these interests; and (3) identification and enforcement of fiduciary duties for the sustainable stewardship of water resources.

The characterization of property in water as a web of interests may aid in adapting to the complex and interdependent characteristics of water in society today and the resulting need for more sustainable management of water resources. Water law experts Sandra Zellmer and Jessica Harder have expressly embraced the web-of-interests metaphor in arguing for a reconceptualization of water as property, and have made some additional points about the superiority of a web metaphor. They write:

We agree with Tony Arnold that a web of interests is a more appropriate metaphor for property. The web emphasizes the interrelatedness of things and people, and unlike the bundle, places the thing in question smack dab in the middle of the inquiry. Placing the thing at the center is not meant to

indicate that it is necessarily the most important part of the web; instead, it shows that all interest-holders have the thing in common.

The web is more effective for infusing property rights with environmental and communal considerations while reflecting the complex interrelationships between people, society, and things than is a collection of rights or sticks bound together in a lifeless, wooden bundle.

Using a web as our metaphor for property has the added virtue of being a design innovation inspired by nature. The inherent physical characteristics of a web help illustrate the attributes of property, and make the web's ecological dimensions an ideal metaphor for it. Spider webs are natural marvels. The remarkable attributes of spider silk make it the "Holy Grail" of biomaterials. These qualities are quite similar to human expectations about property. Webs do not dry out or decay, and, like property, if sheltered, they can out-last their creators. Some of the threads within the web are silky smooth while others are sticky, just as some aspects of property are crystal clear while others are muddy or viscous. Despite being extremely fine, filaments in a spider web are three times stronger than steel of the same diameter, but at the same time, elastic enough to stretch up to 40 percent of their length before breaking. Similarly, people create intangible but powerful emotional bonds with certain forms of property. Like these human relationships, webs exhibit great variability, both in thickness and composition, depending on different types of spiders and the spider's purpose in creation.

Though no two webs are exactly alike, a few fundamental elements must be present for their formation. Each web consists of a firm web-frame around a central hub of silk. The web structure and basic building blocks of the web-strands themselves are unique and, at the same time, elemental. A structurally sound web must have both a dragline, to transport the spider and tie the web to a stable structural base, and a web-frame to support and give form to the filaments. Requirements at an even more basic level exist for these construction cornerstones –special protein-rich fibers. The amino acids in the web-protein have a specific sequence and content that make the web protein so strong. So too, interests in property must be composed of certain key ingredients to be recognized as full property rights under the law (takings property) – a durable interest in the exclusive possession and use of a discrete marketable asset.

On a less tangible, yet perhaps more visceral level of examination, the web as a symbol stands for something more than what is seen or touched. Like human cognition and decision-making, and like relationships to a thing subject to property law, webs are more than just a collection of concentric and linear strands; each is composed of multiple nodes, or points of interaction, and multiple feedback loops. Ecologically speaking,

the nodes of a web serve as points of intersection or interaction, while the web connectors serve as pathways for positive or negative feedbacks. In cognitive psychology, nodes and feedback loops, or pathways, form the semantic networks so fundamental to drawing analogies between familiar experiences and newly encountered things and experiences and drawing rational conclusions. For the property web, these nodes and feedback loops extend to, from, and between interested persons, the community, and the thing.⁵⁹

The web-of-interests concept recognizes the many types of shared interests in resources and thus can accommodate both public and private interests in water, both state ownership and individual rights, and the many interests of institutions, users, investors, regulators, conservationists, communities, and others. Water law is a mosaic of the state ownership doctrine,⁶⁰ the public trust doctrine,⁶¹ prior appropriation rights,⁶² riparian rights,⁶³ groundwater rights,⁶⁴ the

⁵⁹ Zellmer & Harder, *supra* note 21, at 719-21 (citations omitted).

⁶⁰ See, e.g., Mont. Const. art. IX, § 3; Utah Code § 73-1-1 (2010); Va. Code Ann. § 1-302 (2005); Bamford v. Upper Republican Natural Resource District, 512 N.W.2d 642 (Neb. 1994); Baeth v. Hoisveen, 157 N.W.2d 728 (N.D. 1968); *In re Water Use Permit Applications (Waiahole Ditch)*, 9 P.3d 409 (Haw. 2000).

⁶¹ See, e.g., Illinois Central Railroad v. Illinois, 146 U.S. 387 (1892); Phillips Petroleum Co. v. Mississippi, 484 U.S. 469 (1988); National Audubon Society v. Superior Court, 658 P.2d 709 (Cal. 1983); Matthews v. Bay Head Improvement Association, 471 A.2d 355 (N.J. 1984); San Carlos Apache Tribe v. Superior Court ex rel. Maricopa County, 972 P.2d 179 (Ariz. 1999); *In re Water Use Permit Applications (Waiahole Ditch)*, 9 P.3d 409 (Haw. 2000); Robin Kundis Craig, *A Comparative Guide to the Eastern Public Trust Doctrine: Classifications of States, Property Rights, and State Summaries*, 16 PENN ST. ENVTL. L. REV. 1 (2007); Robin Kundis Craig, *A Comparative Guide to the Western States' Public Trust Doctrines: Public Values, Private Rights, and the Evolution Toward an Ecological Public Trust*, 37 ECOLOGY L.Q. 53 (2010).

federal navigation servitude,⁶⁵ federal reserved water rights,⁶⁶ federal environmental statutes and regulations,⁶⁷ state permitting and regulatory

⁶² See, e.g., *Coffin v. Left Hand Ditch Company*, 6 Colo. 443 (1882); *Jenkins v. State Department of Water Resources*, 647 P.2d 1256 (Idaho 1982); *State Department of Ecology v. Grimes*, 852 P.2d 1044 (Wash. 1993); Christine Klein, *The Constitutional Mythology of Western Water Law*, 14 VA. ENVTL. L.J. 343 (1995); A. Dan Tarlock, *The Future of Prior Appropriation in the New West*, 41 Nat. Resources J. 769 (2001).

⁶³ See, e.g., *Pyle v. Gilbert*, 265 S.E.2d 584 (Ga. 1980); *Beacham v. Lake Zurich Property Owners Association*, 526 N.E.2d 154 (Ill. 1988); *Hoover v. Crane*, 106 N.W.2d 563 (Mich. 1960); Joseph Dellapenna, *Adapting Riparian Rights to the Twenty-First Century*, 106 W. VA. L. REV. 539 (2004).

⁶⁴ See, e.g., *State v. Michels Pipeline Construction, Inc.*, 217 N.W.2d 339 (Wis. 1974); *Sipriano v. Great Springs Waters of America, Inc.*, 1 S.W.3d 75 (Tex. 1999); A. DAN TARLOCK, STATE ENVTL. RESOURCE CTR., *BOTTLED WATER: LEGAL ASPECTS OF GROUNDWATER EXTRACTION* (2004); Glennon, *supra* note 54.

⁶⁵ See, e.g., *United States v. Rands*, 389 U.S. 121 (1967); *United States v. Willow River Power Company*, 324 U.S. 499 (1945); *Gibson v. United States*, 166 U.S. 269 (1897); *Palm Beach Isles Associates v. United States*, 58 Fed. Cl. 657 (2003).

⁶⁶ See, e.g., *Winters v. United States*, 207 U.S. 564 (1908); *Caepfert v. United States*, 426 U.S. 128 (1976); *United States v. New Mexico*, 438 U.S. 696 (1978).

⁶⁷ See, e.g., Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. § 1251 et seq. (2010); Endangered Species Act, 16 U.S.C. § 1531 et seq. (2009); Robin Kundis Craig, *Adapting Water Federalism to Climate Change Impacts: Energy Policy, Food Security, and the Allocation of Water Resources*, 5 ENVTL. & ENERGY L. & POL'Y J. (forthcoming 2010); Todd Votteler, *The Little Fish That Roared: The Endangered Species Act, Groundwater Law, and Private Property Rights Collide*, 28 ENVTL. L. 845 (1998); HOLLY DOREMUS & A. DAN TARLOCK, *WATER WAR IN THE KLAMATH BASIN: MACHO LAW, COMBAT BIOLOGY, AND DIRTY POLITICS* (2008).

requirements (including public interest criteria and area-of-origin protections),⁶⁸ inter-jurisdictional sharing of waters,⁶⁹ institutional management of water supplies,⁷⁰ public recreational rights,⁷¹ instream flow rights,⁷² watershed planning and management,⁷³ and other features. Out of this mosaic, ordered structure

⁶⁸ See, e.g., Fla. Stat. § 373.223 (2010); *Harloff v. City of Sarasota*, 575 So.2d 1324 (Fla. 1991); *Southwest Florida Water Management District v. Charlotte County*, 774 So.2d 903 (Fla. App. 2001); *Shokal v. Dunn*, 707 P.2d 441 (Idaho 1985); *In re Application for Change of Appropriation Water Rights*, 816 P.2d 1054 (Mont. 1991); Dellapenna, *supra* note 63; Consuelo Bokum, *Implementing the Public Welfare Requirement in New Mexico's Water Code*, 36 NAT. RESOURCES J. 681 (1996).

⁶⁹ See generally Dellapenna, *supra* note 53; Noah D. Hall, *Toward a New Horizontal Federalism: Interstate Water Management in the Great Lakes Region*, 77 U. COLO. L. REV. 405 (2006).

⁷⁰ See, e.g., ADAPTIVE GOVERNANCE AND WATER CONFLICT: NEW INSTITUTIONS FOR COLLABORATIVE PLANNING (John T. Scholz & Bruce Stiftel, eds., 2005); Barton H. Thompson, *Institutional Perspectives on Water Policy and Markets*, 81 CAL. L. REV. 671 (1993); Denise H. Lach et al., *Maintaining the Status Quo: How Institutional Norms and Practices Create Conservative Water Organizations*, 83 TEX. L. REV. 2027 (2005); Kathleen A. Miller et al., *Water Allocation in a Changing Climate: Institutions and Adaptation*, 35 CLIMATIC CHANGE 157 (1997).

⁷¹ See, e.g., *Arkansas v. McIlroy*, 595 S.W.2d 659 (Ark. 1980); *Conaster v. Johnson*, 194 P.3d 897 (Utah 2008).

⁷² See, e.g., *In re Adjudication of the Existing Rights to the Use of All the Water Within the Missouri River Drainage Area*, 55 P.3d 396 (Mont. 2002); *Phelps Dodge Corp. v. Arizona Dep't of Water Resources*, 118 P.3d 1110 (Ariz. App. 2005) (interpreting A.R.S. sec. 45-152) POSTEL & RICHTER, *supra* note 16; GILLILAN & BROWN, *supra* note 16; Jesse A. Boyd, *Hip Deep: A Survey of State Instream Flow Law from the Rocky Mountains to the Pacific Ocean*, 43 NAT. RESOURCES J. 1151 (2003).

⁷³ See, e.g., A. Dan Tarlock, *Putting Rivers Back in the Landscape: The Revival of Watershed Management in the United States*, 14 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 1049 (2008);

emerges if we think of water as a public resource, owned by the state, but subject to recognized private, public, local, and federal interests in the water. In contrast, efforts to make private rights to water dominant, while arguably more consistent with a bundle-of-rights concept, fail to give sufficient attention to public, state, and other nonprivatized interests and would seem to call for ignoring or rejecting certain well-established doctrines, such as the state ownership doctrine or the public trust doctrine.⁷⁴

Moreover, property interests in water should be defined by the unique characteristics of water in both society and nature. Water is not merely an economic commodity protected by abstract legal rights. It is also an essential element of nature, having physical, chemical, biological, and ecological characteristic. It is an essential element of society and has social, cultural, political, religious, and ethical characteristics. The web-of-interests concept of property allows for consideration of these characteristics not only of water in general but also of particular waters, such as the ecological functions of instream flows, the carrying capacity of aquifers, and the reliance of local communities on water in particular places.⁷⁵

Finally, the web-of-interests concept of property emphasizes that property is defined by “interests,” not merely rights. Thus, those who hold property interests have relationships carrying responsibilities or duties, not just rights-based claims. I have previously proposed a reconceptualization or evolution of state ownership and public trust doctrines into a more integrated and broader “public stewardship of water,” in which the state government, as the trustee of water

Douglas S. Kenney, *Historical and Sociopolitical Context of the Western Watersheds Movement*, 35 J. AM. WATER RESOURCES ASS'N 493 (1999); Jon Cannon, *Choices and Institutions in Watershed Management*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 379 (2000); UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (U.S. EPA), EPA 840-R-00-001, PROTECTING AND RESTORING AMERICA'S WATERSHEDS: STATUS, TRENDS, AND INITIATIVES IN WATERSHED MANAGEMENT (2001), <http://www.epa.gov/owow/protecting/restore725.pdf>.

⁷⁴ Arnold, *supra* note 51, at 836-37.

⁷⁵ *Id.* at 837-39,

resources, would have six fiduciary duties with respect to the ownership, management, governance, and allocation of water: (1) the duty of security; (2) the duty of conservation; (3) the duty of sustainability; (4) the duty of equity; (5) the duty of investment; and (6) the duty of long-range, place-based planning.⁷⁶ These are not merely government duties:

However, unlike typical trusts, these duties must also be shared by every member of the public and the public as a whole. While each of us is a beneficiary of the government's ownership, control, management, allocation, conservation, and stewardship of water, each of us also profoundly affects how the government's responsibility for water is effectuated by the ways we use water, influence water decisions, demand water, and affect water quality and watersheds through a myriad of activities. We are co-beneficiaries but we are also co-trustees or co-managers of waters, water supplies and systems, and watersheds. The term "public stewardship" aims to capture this sense in which the government and the public share responsibility for being good and wise stewards of limited water resources that are essential to life, society, and nature.⁷⁷

These responsibilities require rethinking how property interests in water are characterized and defined. They require the evolution of water law specifically and property law generally to a more integrationist and more sustainable reconceptualization of 'bundles of rights' in water and 'webs of interests' in water.

VI. SUSTAINABLE WEBS OF INTEREST: THE EVOLUTION OF INTEGRATION

As Eric Freyfogle has pointed out, one of the core sustainability problems with respect to property institutions and practices is fragmentation.⁷⁸ Property law, particularly as embodied in the bundle-of-rights concept, treats one right as distinct from another, even though all are interconnected in shared interests and responsibilities for stewardship of resources. It treats one property owner as

⁷⁶ *Id.* at 836, 839-48.

⁷⁷ *Id.* at 848-49.

⁷⁸ Eric T. Freyfogle, *The Tragedy of Fragmentation*, 32 ENVTL. L. REP. 11321 (2002); FREYFOGLE, *supra* note 23.

distinct from another, even though ecological systems, human communities, and the impacts of individual land and water uses transcend property boundaries. It treats the public and private natures of property as conceptually distinct, even though all property is a mix of public and private characteristics. It treats the social functions of property and the ecological functions of objects of property as distinct, even though both affect one another in complex, dynamic, and unpredictable ways.

Joseph Guth has recently argued that as property law changes with new conditions and needs, it must adapt to the current “ecological age,” in which the interrelationships of property uses and environmental harms require recognition of ecological interests in property.⁷⁹ Iterative and stochastic interactions among complex social and ecological systems are creating evolutionary pressures toward integration within sociolegal systems generally. I have recently made the case that environmental law is undergoing the emergence of integrationist multimodality as the needs for more holistic, yet diverse, approaches to environmental protection become apparent.⁸⁰ One example is the increasing integration of land use (including land development) and water (including water supply management, water quality protection, and overall watershed health and integrity) in “wet growth” policies and methods.⁸¹ Another example is the growing use of watershed-based planning, regulatory problem solving, dispute resolution, and

⁷⁹ Joseph H. Guth, *Law for the Ecological Age*, 9 VT. J. ENVTL. L. 431 (2008).

⁸⁰ Arnold, *supra* note 7.

⁸¹ See, e.g., CRAIG ANTHONY (TONY) ARNOLD ET AL., UNIV. OF LOUISVILLE CTR. FOR LAND USE AND ENVTL. RESPONSIBILITY, KENTUCKY WET GROWTH TOOLS FOR SUSTAINABLE DEVELOPMENT: A HANDBOOK ON LAND USE AND WATER FOR KENTUCKY COMMUNITIES (2009); CRAIG ANTHONY (TONY) ARNOLD, WET GROWTH: SHOULD WATER LAW CONTROL LAND USE? (2005); Craig Anthony (Tony) Arnold, *Is Wet Growth Smarter Than Smart Growth? The Fragmentation and Integration of Land Use and Water*, 35 ENVTL. L. REP. 10152 (2005).

management activities to address a variety of interconnected problems at watershed scales.⁸²

These integrationist pressures are operating on property law, even though property law is more resistant to change than other fields of law, given its functions of promoting investment security, stable ordering of society, and preservation of human liberty and autonomy. As Holly Doremus has pointed out, property institutions can facilitate the tendency of humans to resist psychologically, culturally, and legally even necessary changes.⁸³ Moreover, “one of the problems of modernity is that social institutions and government regimes are themselves engines of consumerism and the “growth imperative,” responding to public dependence on perpetual growth by supporting and facilitating uses of natural resources beyond nature’s carrying capacity.”⁸⁴ Nonetheless, sociolegal institutions ultimately adapt to changing conditions and evolutionary forces, just as river banks or coastal land structures may have to yield to and be reshaped by the gradual or sudden forces of waters.

The web-of-interests concept of property could be a useful tool of legal analysis in an interconnected and changing socioecological environment. The concept is not a program to turn private property into public property or to eliminate individual rights in property altogether. Private property serves many important values. The web-of-interests metaphor gives particular attention to the

⁸² See Tarlock, *supra* note 73; Kenney, *supra* note 73; Cannon, *supra* note 73; U.S. EPA, *supra* note 73; EDELLA SCHLAGER & WILLIAM BLOMQUIST, *EMBRACING WATERSHED POLITICS* (2008); HANS M. GREGERSEN ET AL., *INTEGRATED WATERSHED MANAGEMENT: CONNECTING PEOPLE TO THEIR LAND AND WATER* (2007); *SWIMMING UPSTREAM: COLLABORATIVE APPROACHES TO WATERSHED MANAGEMENT* (Paul A. Sabatier et al., eds., 2005); THOMAS E. DAVENPORT, *THE WATERSHED PROJECT MANAGEMENT GUIDE* (2003).

⁸³ Holly Doremus, *Takings and Transitions*, 19 J. LAND USE & ENVTL. L. 1 (2003).

⁸⁴ Arnold, *supra* note 51, at 813 (citing Robert J. Antonio, *Climate Change, the Resource Crunch, and the Global Growth Imperative*, 26 CURRENT PERSP. SOC. THEORY 3 (2009)).

nature of relationships that interest holders form with the objects of those interests. For example, the many relationships that homeowners and renters form with their homes – their places of residence – should prompt courts to give higher scrutiny to government expropriation (taking) of residential property or to award higher compensation than a merely abstract and impersonal “fair market value.”⁸⁵

However, the proposal to analyze property as a web of interests is an effort to recognize that property institutions contain not only individual rights but also shared interests and stewardship responsibilities. Moreover, these rights, interests, and responsibilities arise in interconnected human and ecological environments. An adaptive response to unsustainable land and water uses in complex, interconnected environments would be the emergence of an integrationist concept of property, such as the web of interests.

⁸⁵ Thus, a web-of-interests analysis would differ substantially from that of the U.S. Supreme Court’s majority in *Kelo v. City of New London*, 545 U.S. 469 (2005).

